TREES, SHRUBS AND VINES FOR THE SOUTHERN GREAT PLAINS 1/

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The use of trees, shrubs and vines in farm and ranch home beautification and protection has been given much consideration by residents of the Southern Plains. The value of windbreaks for protection of yards, buildings, feed lots, and service areas has long been recognized by those who are interested in making a livable home in the Plains. Limited rainfall, extremes of temperatures, and adverse soil types in a large part of the area have made the selection of species of plant materials and their care a special problem.

A continued search for plant materials that might be useful in the region has been in progress since the establishment of the Station in 1914. A comprehensive research program has been in progress since 1931 to determine which species and selections of plants are best adapted to the variable soil and local climatic conditions of the area. The main experimental plantings have been made on the grounds of the Southern Great Plains Field Station and on those of the several field stations of the U. S. Department of Agriculture and the State branch experiment stations in the area. In addition to these key plantings, over 500 cooperative experimental plantings have been established with farmers and ranchers in more than 100 counties in the Southern Plains. Lack of funds caused a serious curtailment of this important research program in 1948.

The cooperative tests have furnished considerable information on the growth of plant materials. The preliminary results of these investigations are summarized below. Further studies will be necessary before definite conclusions can be drawn.

Farm and Ranch Windbreaks

In that part of the Southern Plains where relatively heavy snowfall can normally be expected, a three-to-five-row windbreak of trees is most desirable. In the warmer portion of the area, a two-or-three-row windbreak will usually give sufficient protection. In all cases, the windbreak should be planted from 75' to 100' from the protected site, so that drifting snows will not be deposited in the center of the area to be protected. The plantings should be made continuous on the west and north, with a wide-sweeping curve that will allow for plenty of cultivating room. On the south side it may be desirable to have a single-or-two-row windbreak to partially check the southerly summer winds. The south windbreak should not be so heavy that it will prevent good air circulation around the homesite.

Windbreaks for gardens are especially valuable in the Southern Plains. Extreme care should be taken, however, so that aggressive species, such as the Chinese Elm, are not used adjacent to garden areas. This species will send out roots 75' or more from the base and use up all available moisture and soil nutrients. Garden windbreaks should be made of species that have a compact root system that do not spread out over a wide area, such as Privets, Honeysuckles, Spireas, and Chinese Aborvitae.

If this low windbreak is not sufficient, a single row of a taller-growing species can be planted 50 to 75 feet south of the low row.

Kind of Trees:

The best windbreak is one that will furnish year-long protection. Evergreens are superior to deciduous trees. Red Cedar is the number one selection for most of the Southern Plains. This native of the eastern portion of the area has been tested in the entire Southern Plains and has been found to be adapted to a wide variety of soil types and growing conditions. In one of the testing blocks on the station, the Red Cedar has been making an average annual growth of 15 inches for the past 14 years. This site was one that had proved to be unsuitable for growing row crops. The trees in this test were planted on the contour and have been given clean cultivation but no irrigation. A spacing of 15 feet between trees and 20 feet between rows was believed to be a very wide spacing at the time the planting was made. At the present writing the limbs of the trees in the row are overlapping and form a very dense windbreak. There is still sufficient room to cultivate in the rows. In the same planting, made during the dry year of 1935, the Rocky Mountain Juniper has made an average annual growth of 11 inches. This juniper is the one that has the very attractive silvery-green foliage and makes a generally more compact growth than our native cedar. It's slower rate of growth is more than offset by it's attractive appearance. When used alternately in a row with the Red Cedar, a pleasing type of windbreak can be obtained. In the higher elevations of the Southern Plains, the Rocky Mountain Juniper makes a relatively better rate of growth than at lower elevations, and should be given preference over all other junipers and cedars. The Oneseed Juniper is native to the panhandles of both Texas and Oklahoma and westward through the Southern Plains. When found in it's natural habitat, it is a many-stemmed conifer that does not make a tall tree. We have found, by planting seeds from many sources, that there are many types of the species. The most desirable selection is almost single stemmed, carries a heavy foliage, and makes a more upright growth than the typical plant. When used in the higher elevations in the Southern Plains, it makes a desirable border-row, windbreak species.

All of the principal species of pines native to the United States and many introduced species have been tested in the Plains. The Austrian Pine has proved to be the most desirable pine windbreak species for the Woodward area and the east side of the Southern Plains. As the elevation increases westward the Ponderosa Pine has a slight preference over the Austrian Pine. Here at Woodward the Austrian Pine has been averaging 15 inches of growth per year, and the Ponderosa Pine has averaged 12 inches of growth per year. Both pine species prefer sandy or open soil types, whereas the cedars and junipers prefer the heavier soil types. All of the above conifers will grow on most of our medium loamy soils found on the High Plains.

A simple but effective windbreak can be obtained by using one row of alternate plants of Austrian and Ponderosa Pine and one row of alternate plants of Rocky Mountain Juniper and Red Cedar. If these are planted 12 to 16 feet apart in the rows, with the rows 20 to 25 feet apart, our tests indicate that a useful, long-lived windbreak will result. A combination of alternate plants of all four species in rows makes the most aesthetic type of windbreak that can be used on the Plains. The different shades of green, varied forms, and texture give considerable interest to the planting. When a single species is used in a row, the evergreens form a single wall of even color and texture and adds severity to an already relatively harsh landscape. The mixed planting does away with the monotonous uniformity of a single-species row.

The Chinese Elm still holds the top rating among deciduous trees for general use. However, it has been used too freely at the expense of other more desirable species, including the conifers. Chinese Elm has the ability to adapt itself to a wide variety of soils and can withstand considerable drought, but has been subject to winter injury and suffers from sleet and hail damage. The oldest tree in all of the Plains area was planted in 1914, but died in 1940 as a result of an unusually severe winter. At the Woodward Station, we still have many trees of the species that were planted in 1917. These have suffered various degrees of injury from winter storms. The "bleeding" of the Chinese Elm has never been satisfactorily controlled as yet. Many selectinns of this species and of hybrids have been tested since 1935, but we still are in search of one that is better than the typical species.

Thornless Honey Locust and the Lacebark Elm (Parvifolia elm) are two important species for use in the Southern Plains. Thornless Honey Locust makes a very rapid rate of growth and serves a useful purpose as an interior row in the windbreak. It does not have the amount of foliage that is carried on the elms, but has a great deal of drought resistance and does well on average soil sites. Selections of this species on the Station are the parent plants of several million trees now growing in parts of seven nearby States. Seeds have been distributed through commercial nurseries, State and Federal agencies, and cooperative experimental plantings. Lacebark Elm has not been as freely used as it deserves. Early tests with the species were with a very slow-growing strain that discouraged its' general use. Later selections make a growth comparable to that of the American Elm. Lacebark Elm is much more drought-resistant than American Elm and can be used on more adverse sites. A type planted on the Station in 1931 now measures over 26 feet in height. The wood of this species is much stronger than common Chinese Elm and is, therefore, not so subject to breakage. Lacebark Elm makes a compact growth and develops a more uniform type tree.

In a three row windbreak, the row nearest the buildings can be one of the conifers or a combination of two or more, followed with a row of Lacebark Elm or a row of Smooth Honey Locust, and an outside row of Chinese Elm. Always try to plant a buffer row of some deciduous tree species between the conifers and the Chinese Elm. For a five row windbreak, use two rows of conifers, two of the Smooth Honey Locust or one each of the Smooth Honey Locust and Lacebark Elm, and finally a border row of Chinese Elm.

Other border row species that can be used in the windbreak include two shrub species, the Desertwillow, and the Kashgar Tamarix. The tamarix is not the one found growing native along local streamcourses, but has a more attractive bloom and foliage. Both the Desertwillow and Kashgar Tamarix will make a better showing if mowed back to the ground each year or every two years. They tend to develop an unattractive spindly form when not pruned.

Spacing:

Trees in the windbreak should be given plenty of room so that they will survive during periods of extended drought and can be cultivated easily. The rows should be planted 20 or more feet apart. The interval between plants in the row should be 10 to 15 feet. Closer spacing will make a dense windbreak in a shorter interval of time but will not withstand drought. Data secured from spacing tests at Woodward show that species such as the Thornless Honey Locust need 150 square feet or more per tree for survival. Better rates of growth will be secured if wider spacings are used.

Planting:

The success of any tree planting is dependent upon proper planting. One- and two-year-old seedlings of deciduous trees are the most practical to use in windbreaks. These should be handled so that the roots will not dry out. Do not expose any tree roots longer than is absolutely necessary. Plant as quickly as possible after being dug from the nursery row. Dig the holes large enough to conveniently accomodate the roots when spread out in a natural position. Do not crowd the roots in a small hole, but spread them well and fill in around them with pulverized soil. If the soil is of poor quality, it will pay to use good soil in filling the hole. Set the plant one or two inches below the original nursery level. Water thoroughly. Settling the soil around the roots with water is much safer than tamping the soil.

Evergreens should be handled with a small ball of earth for safe survival. If bare-rooted stock is used, be sure to plant a number of extra plants in the garden so that replacements will be available. Our results with bare-rooted evergreens shows that a 50 to 75 percent stand might be possible some years, but the method usually results in failures. This is especially true during dry springs when considerable soil blowing occurs. We have used the balled and burlapped method of handling the bulk of our cooperative plantings since 1935. If small evergreens cannot be secured balled and burlapped, then the bare-rooted seedlings could be planted in the garden for one or two seasons and then moved to the permanent site with a small ball of earth. As soon as the small evergreens are planted, they should be protected by a shingle or board on the south and southwest side of the plants. This will lessen the injury from soil blowing.

All windbreak plantings should be planted on the contour whenever possible. If planted on a slope, the site should be terraced so that runoff can be kept to a minimum.

Care:

Clean cultivation should be practiced in all windbreak plantings in the Southern Plains. Cultivation will have to be done as often as is necessary to keep the planting free of competitive weed growth. This will not be too difficult if the planting is arranged so that the usual tools used in large-scale farming can be used in keeping the land clean. If large shove-type cultivators are on hand, a spacing of 25 feet between rows will be necessary. The hand hoeing that will be necessary between plants will be paid for in terms of vigorous growth.

Trees for Ornamental Use

The hardiest conifers, Red Cedar, Rocky Mountain Juniper, Austrian Pine, and Ponderosa Pine, are excellent trees for use in heavy mass plantings in corners of large yards or as screen plantings. They can be spaced 15 to 18 feet apart if irrigated, using the taller-growing Pines in the background and the small-growing Cedar and Juniper in the foreground. For shade purposes the Lacebark Elm and the Thornless Honey Locust will tolerate a greater variety of soil and weather conditions. American Elm and the eastern Hackberry can be used on favored sites. Other valuable shade trees include the Bur Oak, Chinese Pistache, American Sycamore and the Green Ash. The latter species require considerable irrigation for survival and growth.

Flowering trees that can be used in the Southern Plains include Redbud, Goldenraintree, and Flowering Peaches. Flowering Peaches are relatively short-lived in most of the Plains area. They should be planted as temporary trees in the background of border groups. The small trees can be spaced 12 to 15 feet apart in groups. All large shade trees should be kept 25 or more feet away from foundation plantings. They will set up active competition with the shrubs if planted closer than this. Large deciduous trees, when used as ornamentals, should have a spacing of 35 feet or they will not have room to develop their natural form. If the Chinese Elm is used as a shade tree, be sure to give it plenty of room. This species has about one-third of it's root system in the surface soil. Grass cannot grow in competition with it unless watered and fed very freely.

Shrubs for the Southern Plains

More than one hundred and twenty-five shrub species and varieties of shrubs can be used in various parts of the Southern Great Plains. Only a small number of shrubs that are of general use over a major portion of the Plains have been included in this paper. Tall-growing shrubs that have a place in landscape in the Southern Plains include Beautybush, Buckthorn, Chastetree, Desertwillow, Roughleaf Dogwood, Scarlet Elder, European Euonymus, Winterberry Euonymus, Fortune Fontanesia, New Mexican Forestiera, Amur Honeysuckle, Winter Honeysuckle, Chinese Lilac, Mockorange, Siberian Peatree, Shrubalthea, Smoketree, and Kashgar Tamarix.

Shrubs of medium-height include Bladdersenna, Butterflybush, Spreading Cotoneaster, Crapemyrtle, Forsythia, Pfitzer Juniper, Vonehron Juniper, Flowering Quince, and Vanhoutte Spirea.

Low-growing shrubs useful over most of the Southern Plains include Leadplant Amorpha, Wrights Anisacanthus, Bluebeard, Chenault Coralberry, Indiancurrant Coralberry, Black Dalea, Chamaedrys Germander, Winter Jasmine, Andorra Juniper, Oregon-grape, Mugho Pine, Lodense Privet, and Snowberry.

Many other shrub species can be used in the southern part of the Southern Plains, and on protected sites in other parts of the area. The more tender species, such as Abelia, Evergreen Euonymus, Nandina, Japanese Privet, and the Pyracantha, are useful in the southern part of the area, and can be grown more or less successfully as far north as Woodward.

The tall-growing shrubs are most useful in border and screen plantings. A few species can be used in foundation plantings where heavy mass effect is needed or where the species can be kept to size by regular pruning. The medium-sized and low-growing shrubs can easily be used in foundation plantings where the plants have to be of a relatively small size. The low-growing shrubs are also useful as foreground plants in front of the tall species in heavy screen, border, or mass plantings.

Hedges:

The most important shrub species that can be used for hedges in the Southern Plains include Crapemyrtle, Desertwillow, Roughleaf Dogwood, European Euonymus, Winterberry Euonymus, Fortune Fontanesia, New Mexican Forestiera, Amur Honeysuckle, Winter Honeysuckle, Chinese Lilac, Amur Privet, European Privet, Quihou Privet, Vanhoutte Spirea, and Kashgar Tamarix. Tree species that can be kept to hedge size by regular pruning include Chinese Arborvitae, Red Cedar, Chinese Elm, Lacebark Elm, Rocky Mountain Juniper, Smooth Honey Locust, Russian Mulberry, and Osageorange.

The kind of hedge that can be developed depends, in part, on the method and amount of pruning. All plants, except conifers, should be cut back to the ground as soon as planted. When the new growth is 8 to 12 inches in height, it should be cut back to one-half or less of that height. Subsequent pruning should be made back to within one-half to one inch of the preceeding cut. By trimming in this fashion, a dense, compact, hedge will be developed. If a hedge is allowed to grow two and three feet in height and pruning is started at those levels, only a spindly, open, growth results. It usually requires three to four years to develop a good hedge 30 or 36 inches in height. The proper way to prune hedges is to have tapered sides or rounded tops. In all cases, the best hedges are those that are handled so that the base is wider than the top. This permits a more even distribution of light on all parts of the hedge and prevents the "legginess" often observed in hedges.

Planting:

Like other plant materials, shrubs require considerable care in planting. The plants should always be planted as soon as possible after being dug from the nursery row. Keep the plants covered and never allow the roots to dry out while handling. Dig the hole large enough to accomodate the roots without any crowding. The plants should be planted so they are three to four inches below the surrounding ground level, and have a basin of two to four feet across that can be flooded with water. All deciduous shrubs that are planted bare-rooted should be cut back to the ground as soon as planted. This will induce the development of a series of many canes rather than a few tall, spindly ones. Deciduous and evergreen shrubs that are handled with a ball of earth need not be pruned when transplanted.

Spacing:

A common error made in most foundation and yard plantings is to set the plants too close together. Tall-growing shrubs may have a natural spread of six to ten feet. They should be planted six to ten feet apart so that they will not give that over-planted appearance. Shrubs that are four to six feet in height should have the same interval between plants. Low-growing evergreens, such as the Pfitzer and Vonehron Junipers, need a spacing of five to eight feet apart, depending upon how tall they will be allowed to grow. The smaller deciduous shrubs can be planted two to three feet apart. The interval to plant away from walls, walks, drives, and fences is also dependent upon the size of the species being used. Too often, shrubs are planted 12 and 18 inches away from the foundation of buildings, whereas they should be three to four or more feet away. They seem so small when planted, that it is easy to make the plantings too close.

Pruning:

Spring-flowering shrub species, such as the common Spireas and Forsythias, should be pruned immediately after the blooming period. This will permit new wood to develop the remainder of the season. Very vigorous species, such as the Chaste-tree, Desertwillow and Tamarix, should be cut back to the ground every winter or every two years. This will induce more blooming as well as keep the plant to a smaller size. The Crapemyrtle usually suffers some winter injury as far north as Woodward, so they are regularly cut back to the ground each winter. Plants having five and six-year-old roots will reach a height of three to five feet the following year. The pruning back of Crapemyrtle, Desertwillow, and the Chastetree seems to stimulate the amount of bloom.

Plants that are over-grown can sometimes be renovated by cutting back to the ground level. This is true in the case of specimen plants such as the Privets, Euonymus, Fontanesia, Lilacs, and Spireas that are not too old. Shrubs that are 12 to 15 years old very often can not recover from the shock of severe pruning. In all cases, it should be remembered that most shrubs are relatively short-lived. An old planting very often can not be pruned to size, but has to be completely removed and replaced. Shrub plantings that served a purpose for 10 to 12 years have paid for the use they were intended and deserve replacement.

Care:

Shrubs are usually planted in yards where they are subjected to competition from lawns and from each other. It is essential that they be subject to considerable irrigation if a vigorous, healthy growth is desired. The amount of irrigation can be lessened by practicing clean cultivation as often as possible. This not only prevents weed development, but keeps the soil in a good state of tilth so that it will be more receptive to rainfall. Cultivation will also reduce the amount of wind erosion. In all cases, lawns should be edged away from shrubs for an interval of three to six feet, depending on the size of the shrubs. On sites where very little irrigation is available or where the water is not suitable for irrigation, plantings of shrubs for screen and border plantings can be developed by using a wide spacing of the hardier shrubs to permit moisture storage through cultivation.

Vines for the Southern Plains

Vines that can be used in parts of the Southern Great Plains include Drummond Clematis, Sweet Autumn Clematis, China Fleecevine, native and cultivated varieties of Grapes, Everblooming Honeysuckle, Japanese Honeysuckle, Trumpet Honeysuckle, Boston Ivy, Engelman Ivy, English Ivy, Heartleaved Ivy, Marine Ivy, Monkshoodvine, Roses, Grecian Silkvine, Mme. Galen Trumpetvine, Virginia Creeper, and Wistaria. The Engelmann Ivy, English Ivy, Trumpetvine, and Boston Ivy have aerial rootlets or tendrils with adhesive tips, and can be used on brick, stone or stucco surfaces without the use of trellises. The other species have to be trained on some form of support. For screen, windmill tower, pole, and windbreak fence planting, the more vigorous species, such as China Fleecevine, Heartleaved Ivy, Engelmann Ivy, Monkshoodvine, and the Grecian Silkvine, should be used. As far north as Woodward, the Boston Ivy does best on north exposures. Of the Rose varieties, the American Beauty, Mary Wallace, Paul's Scarlet, Silver Moon, and Dorothy Perkins are the safest varieties to be used. The roses should be confined to sites having considerable wind protection and water. A lattice fence makes an excellent low windbreak for the flower or vegetable garden on the High Plains and when covered with vines, its value is increased many times. Vines often will develop a large mass of branches and foliage at the very top of the support. This form of vine can be avoided by pinching-back the terminal growth of some of the canes as they develop, and will force side-branching of the canes rather than have all the branching develop near the top of the support.

Source of Planting Stock:

Always secure plants that have been grown locally in preference to shipped-in stock. If you cannot secure plants grown in your vicinity, consult your local nurseryman. He may be able to secure the stock from the large growers of nursery stock. Due to the unfavorable conditions for propagating many species, nurserymen in the northern part of the area can profitably raise only a percentage of the

usable species. It is, therefore, necessary to rely on the large growers who are located in areas having more favorable growing conditions to furnish many species. So called "bargain" plants may turn out to be the runts in a crop of plants, and should be avoided. As in the purchase of cattle, seed stocks, etc., the better quality is usually the cheapest even though the initial cost is high.

Needed Research

Many desirable selections of trees and shrubs are now available at the Southern Great Plains Field Station. An expansion should be made of the propagation program so that it would permit the growing of thousands of plants of a species from which selections can be made. Testing of introduced species, selections and varieties has been limited to a few plants of each due to the limitations of the program. The source of plant materials has been limited to those that were collected from native sources, by purchase, and by introduction. Those that have proved to be of value should be propagated for further study.

There is a keen realization of the limitations of the plant materials that are of use in the Southern Great Plains area. Much has been done to prove what can be accomplished with the species we have. The next logical step is to take those plants that have the most promise in the area and use them in a breeding program to develop trees and shrubs for the Southern Plains. It will be necessary to make plants for ornamental and windbreak purposes, just as the plant breeders have made improved sorghums for the Plains.